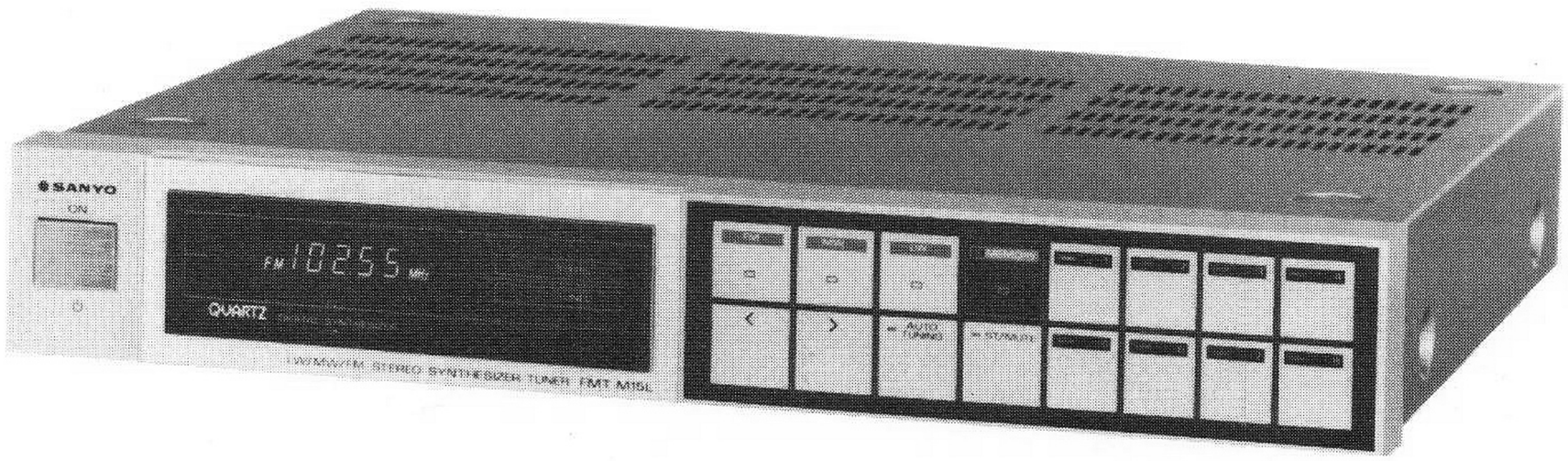
SERVICE MANUAL

SANYO

LW/MW/FM STEREO SYNTHESIZER TUNER

FMT M15L
(EUROPE)



NOTE:
The photo on the cover shows the unit with a "SILVER" front panel. The "BLUE" version is identical in all respects.

SPECIFICATIONS

FM SECTION

Tuning Frequency Range		87.5 MHz to 108 MHz
Usable Sensitivity	Mono (IHF)	1.9 μV
Signal-to-Noise Ratio (at 1 mV)		
	Mono	75 dB
	Stereo	70 dB
Capture Ratio		1.0 dB
Alt. Channel Selectivity (DIN)		70 dB
Image Response Ratio		70 dB
IF Response Ratio		90 dB
AM Suppression Ratio		55 dB
Total Hormonic Distortion (at 1 mV)		
	Mono	0.1 %
	Stereo	0.2 %
Stereo Separation (at 1 kHz)		45 dB

MW LW SECTION

Tuning Frequency Range	MW	LW
	522 kHz to 1,611 kHz	153 kHz to 360 kHz
Usable Sensitivity	200 μV/m	500 μV/m
Selectivity at ±10 kHz	45 dB	50 dB
Image Response Ratio	40 dB	40 dB
IF Response Ratio	60 dB	65 dB
Signal-to-Noise Ratio	55 dB	50 dB

GENERAL SECTION

Power Source	AC: 110/220 V 50 Hz
Power Consumption	12 W
Dimenstions (W x H x D)	335 x 58 x 275 mm
Weight	2.1 kg (approx.)

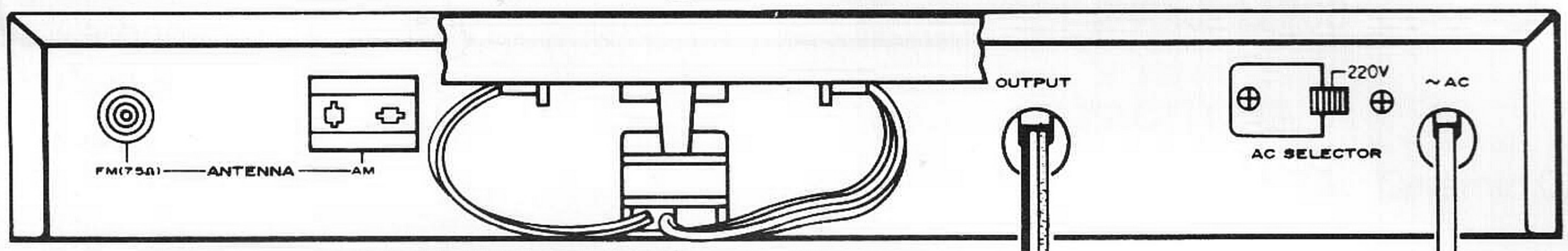
CONNECTING DIAGRAM

a) Turntable TP M15

b) Adjustable ferrite bar antenna

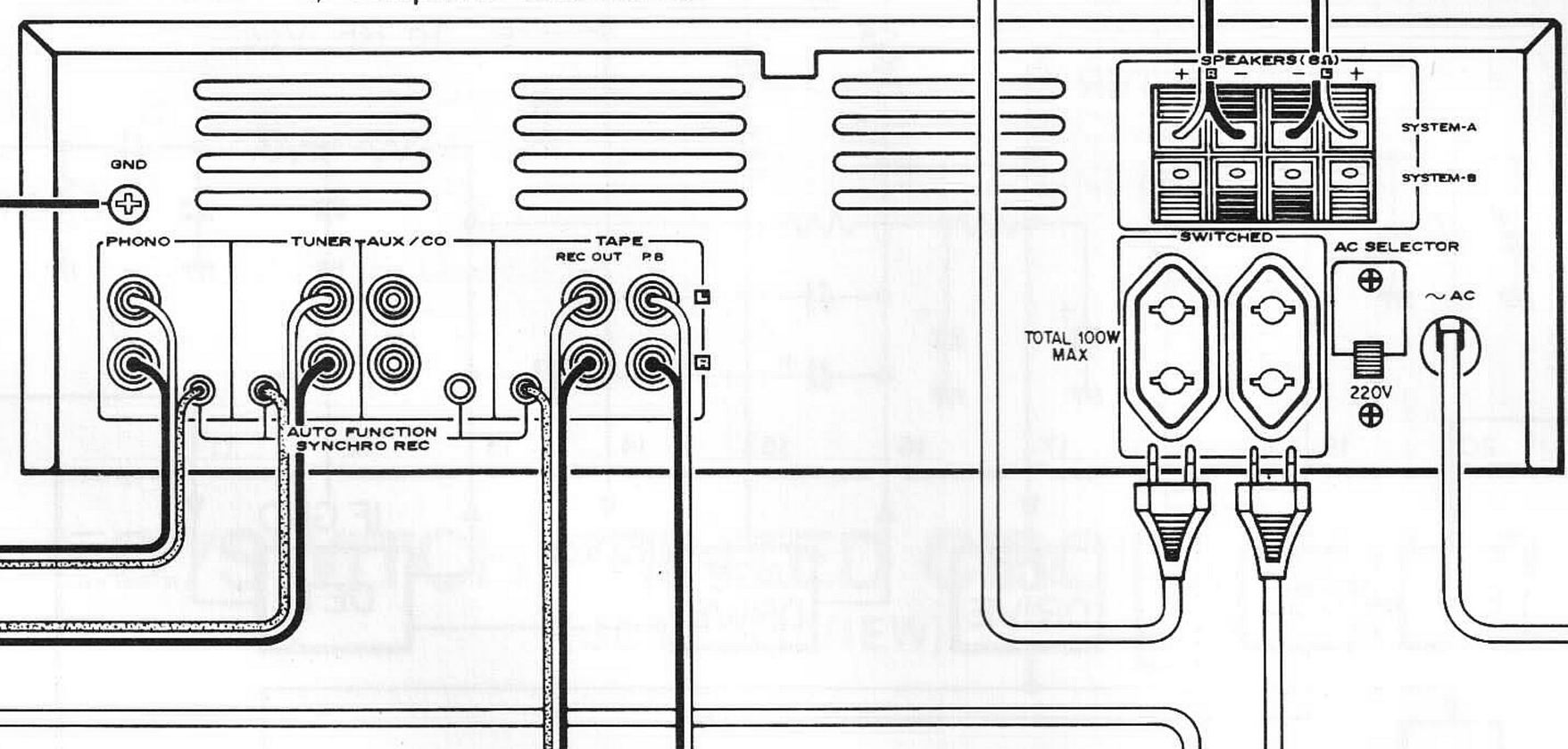
c) Right speaker

d) Left speaker

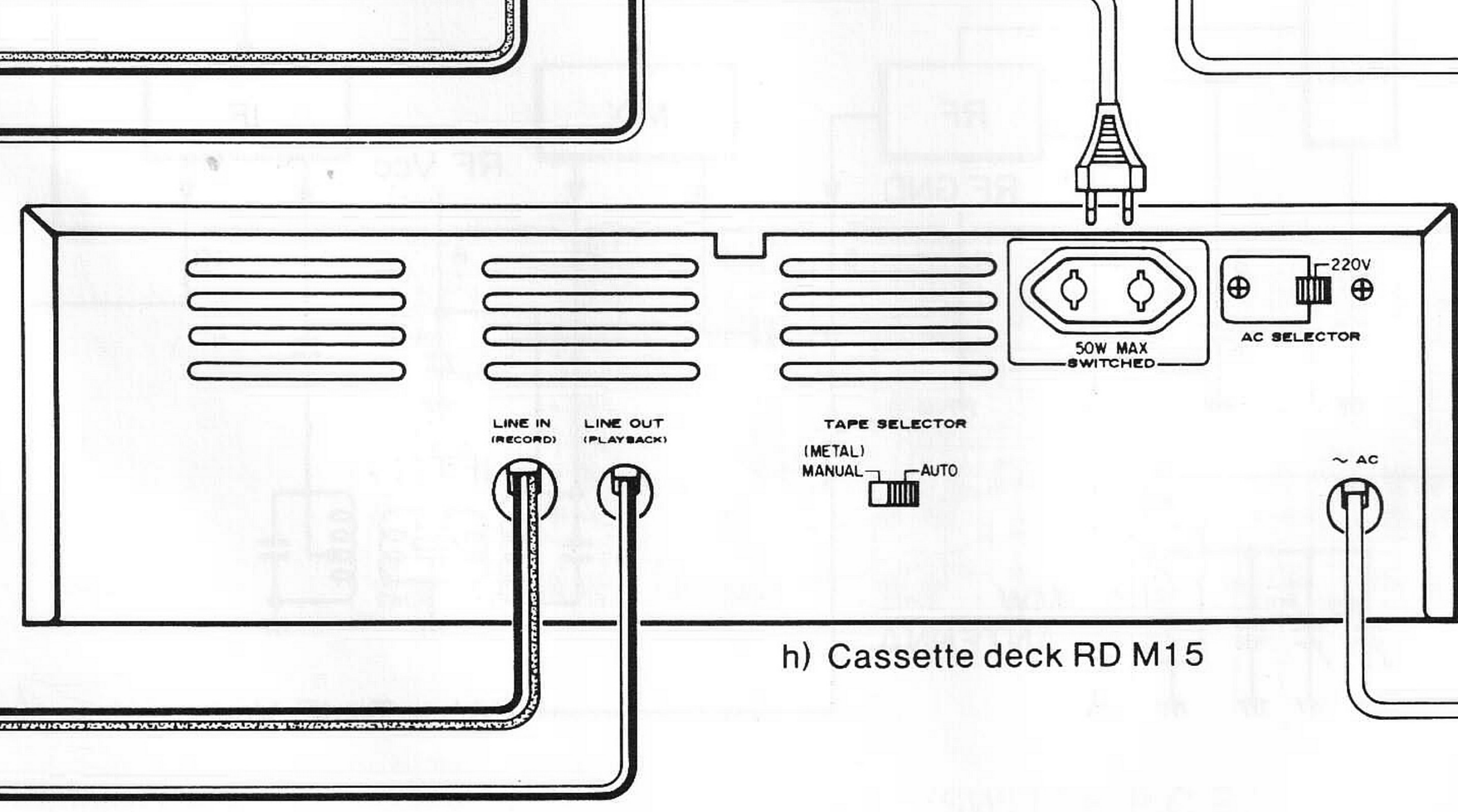


e) Tuner FMT M15L

f) Amplifier DCA M15

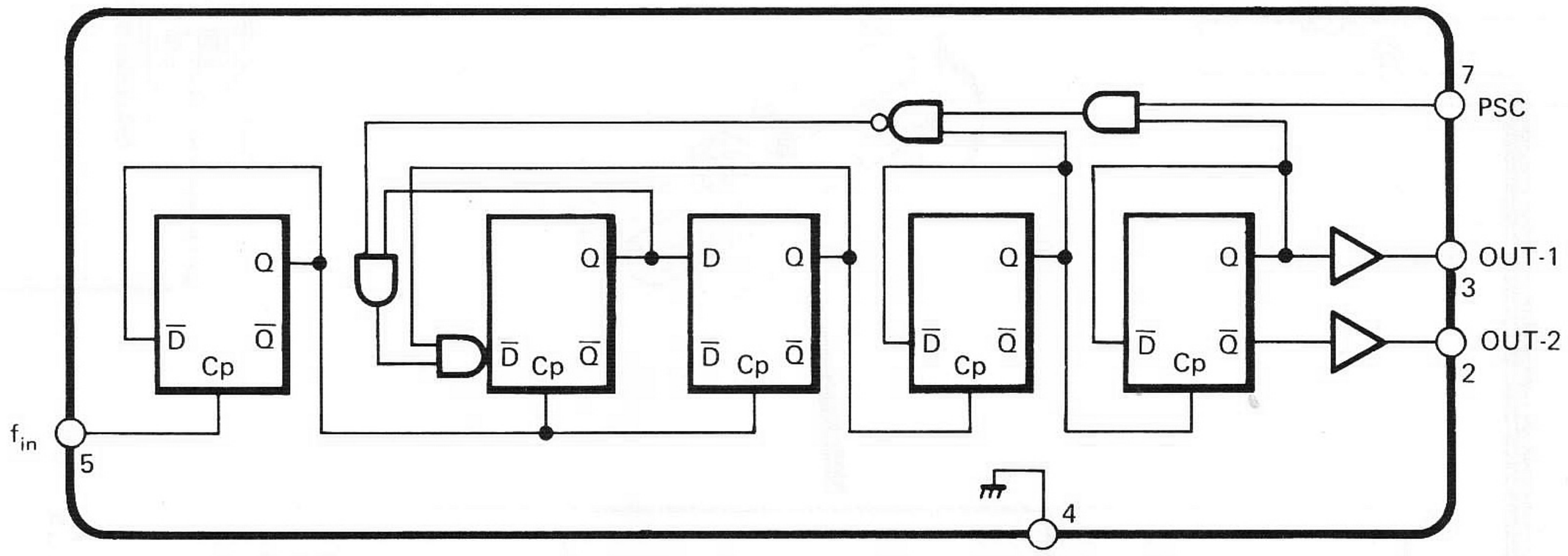


g) To AC wall outlet

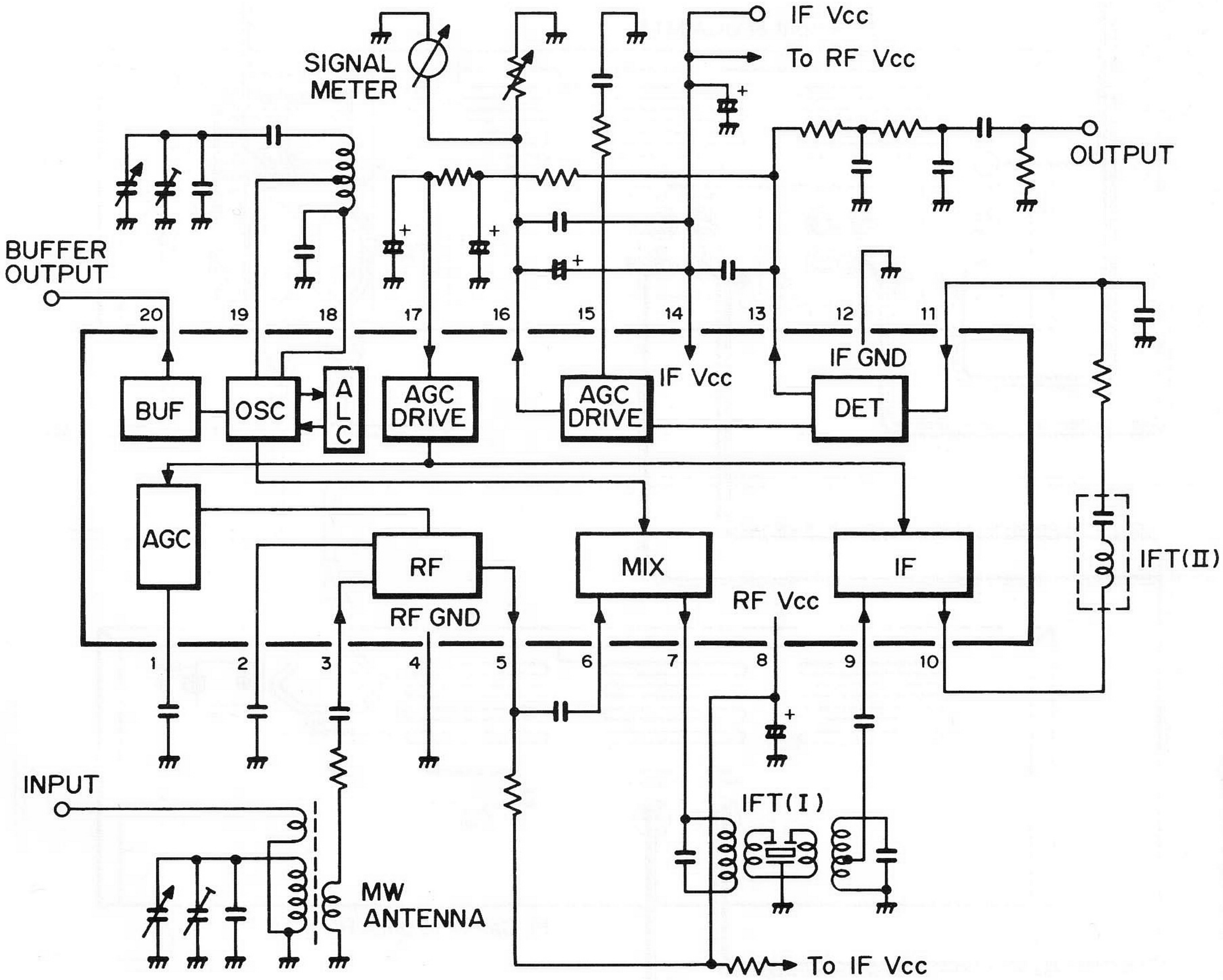


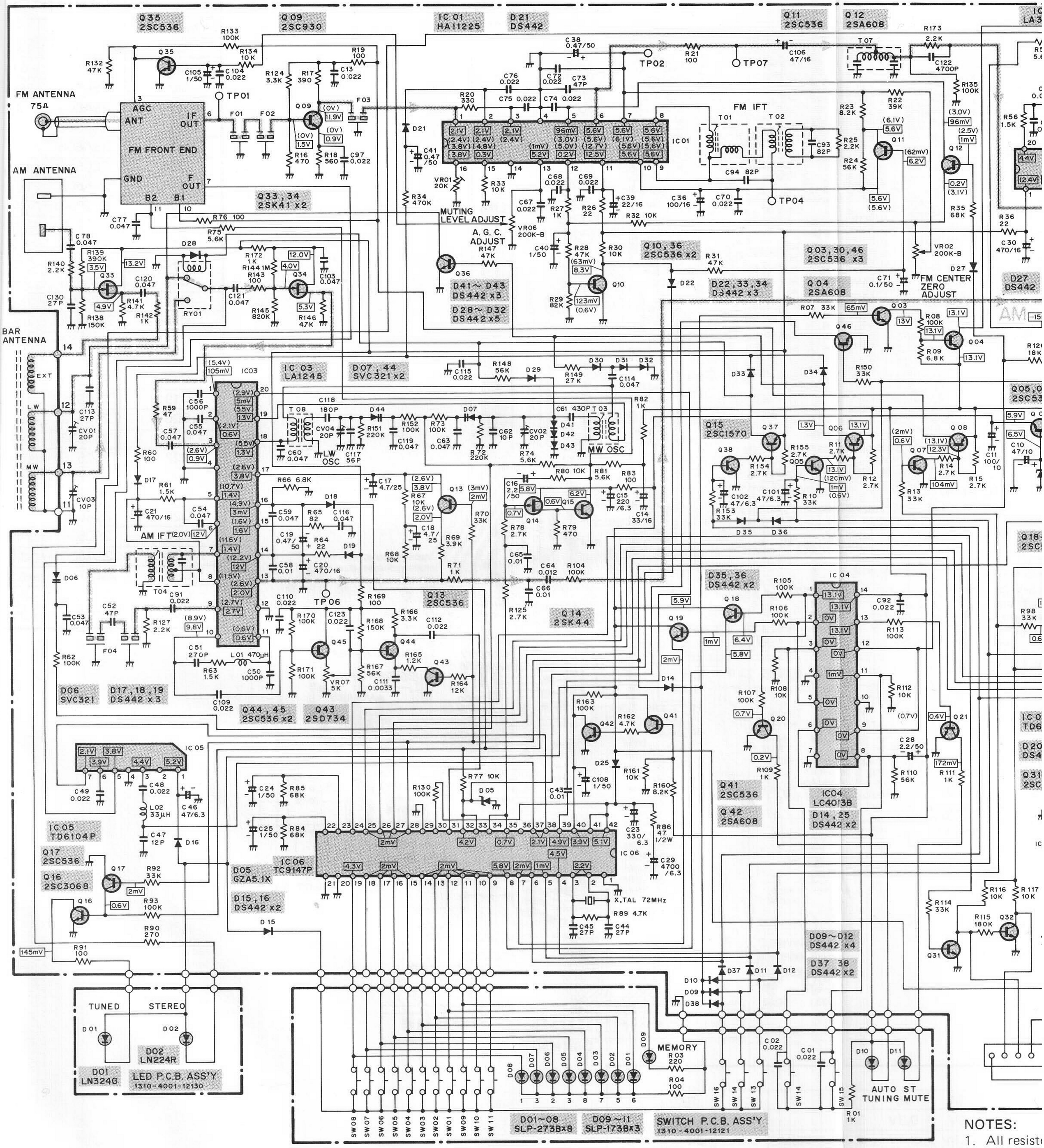
h) Cassette deck RD M15

PRE SCALAR IC TD6104P SIGNAL FLOW



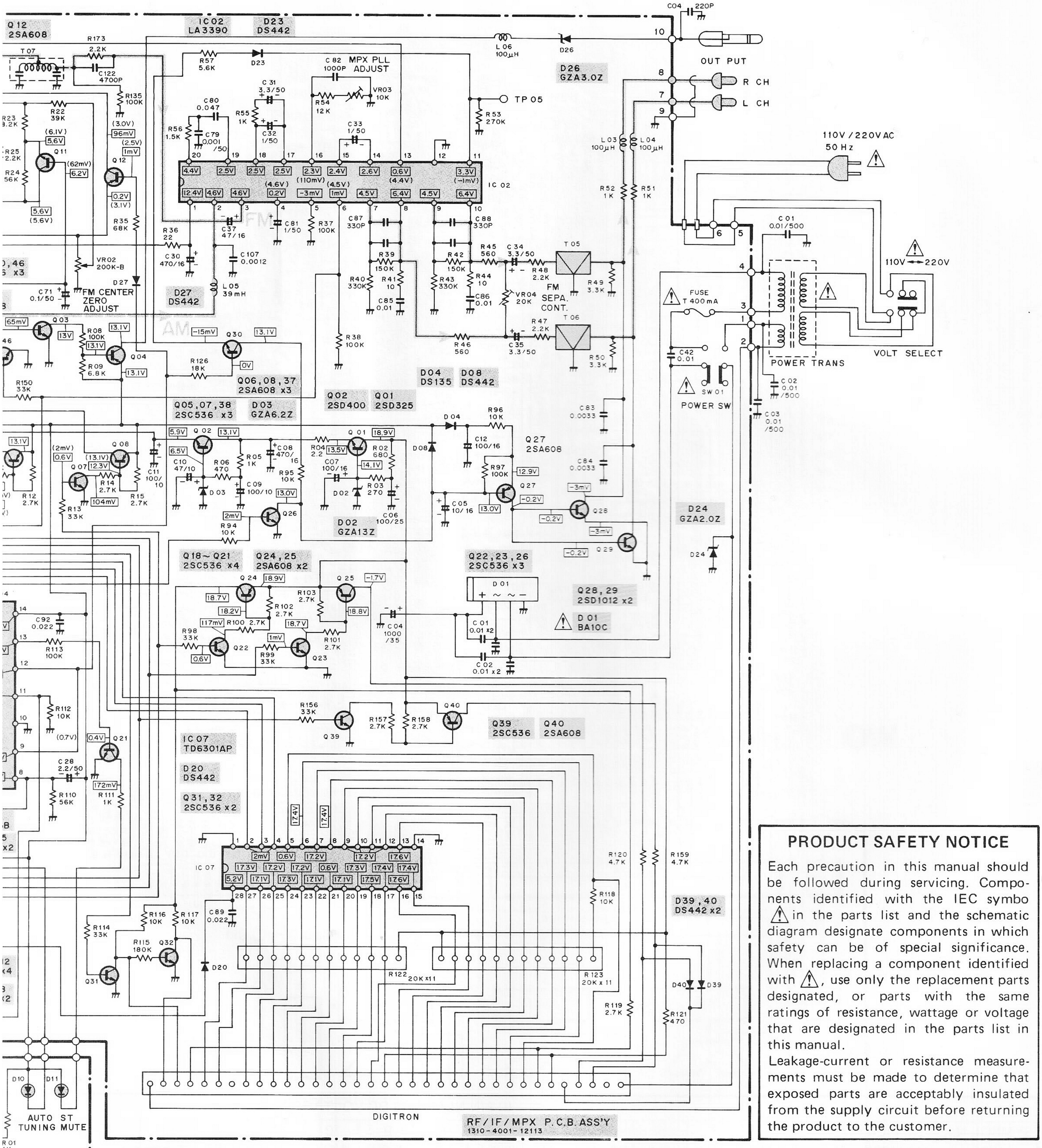
AM RF IF IC LA1245 SIGNAL FLOW





NOTES:

1. All resist
2. All capac



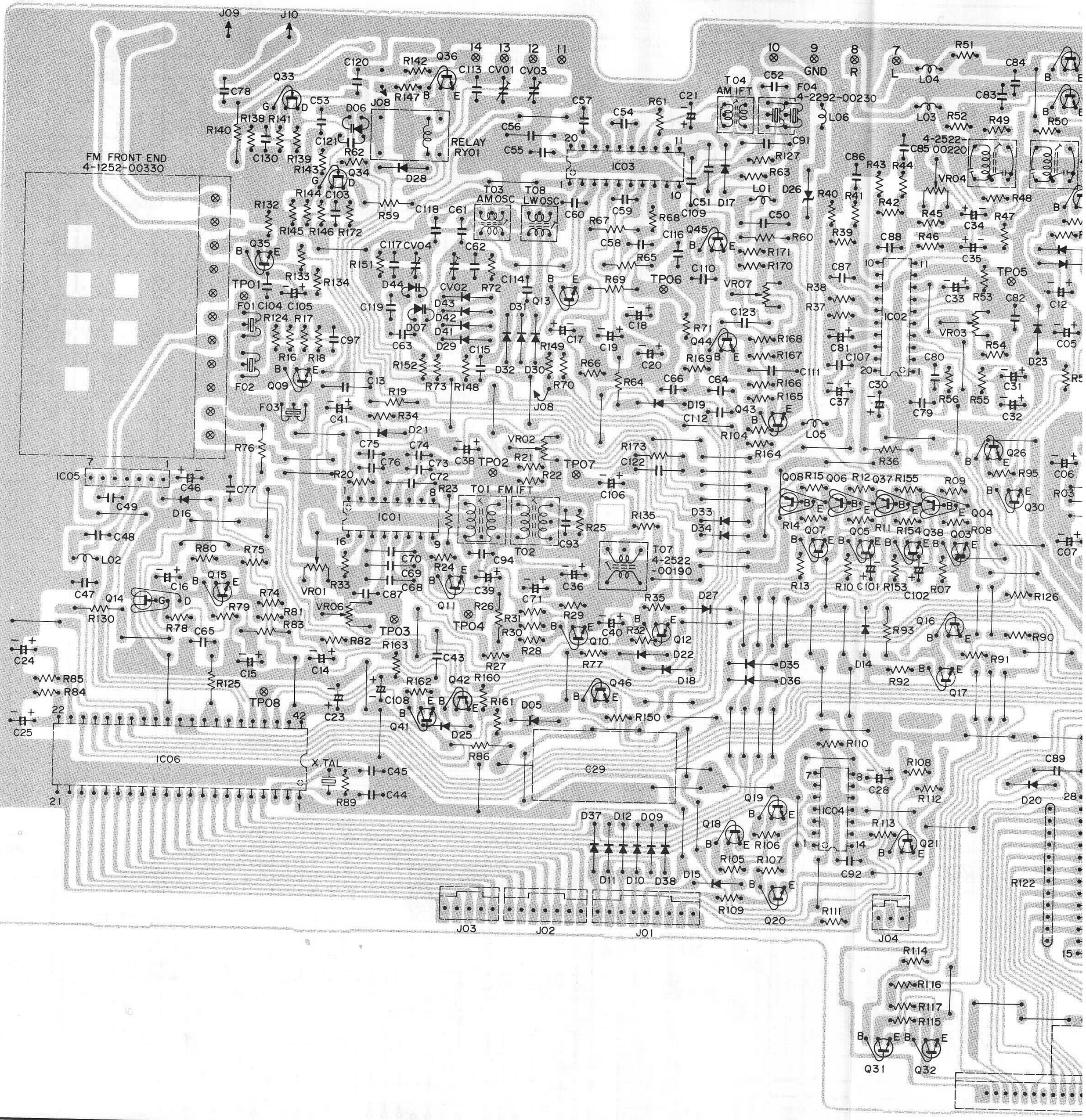
PRODUCT SAFETY NOTICE

Each precaution in this manual should be followed during servicing. Components identified with the IEC symbo ⚠ in the parts list and the schematic diagram designate components in which safety can be of special significance. When replacing a component identified with ⚠, use only the replacement parts designated, or parts with the same ratings of resistance, wattage or voltage that are designated in the parts list in this manual.

Leakage-current or resistance measurements must be made to determine that exposed parts are acceptably insulated from the supply circuit before returning the product to the customer.

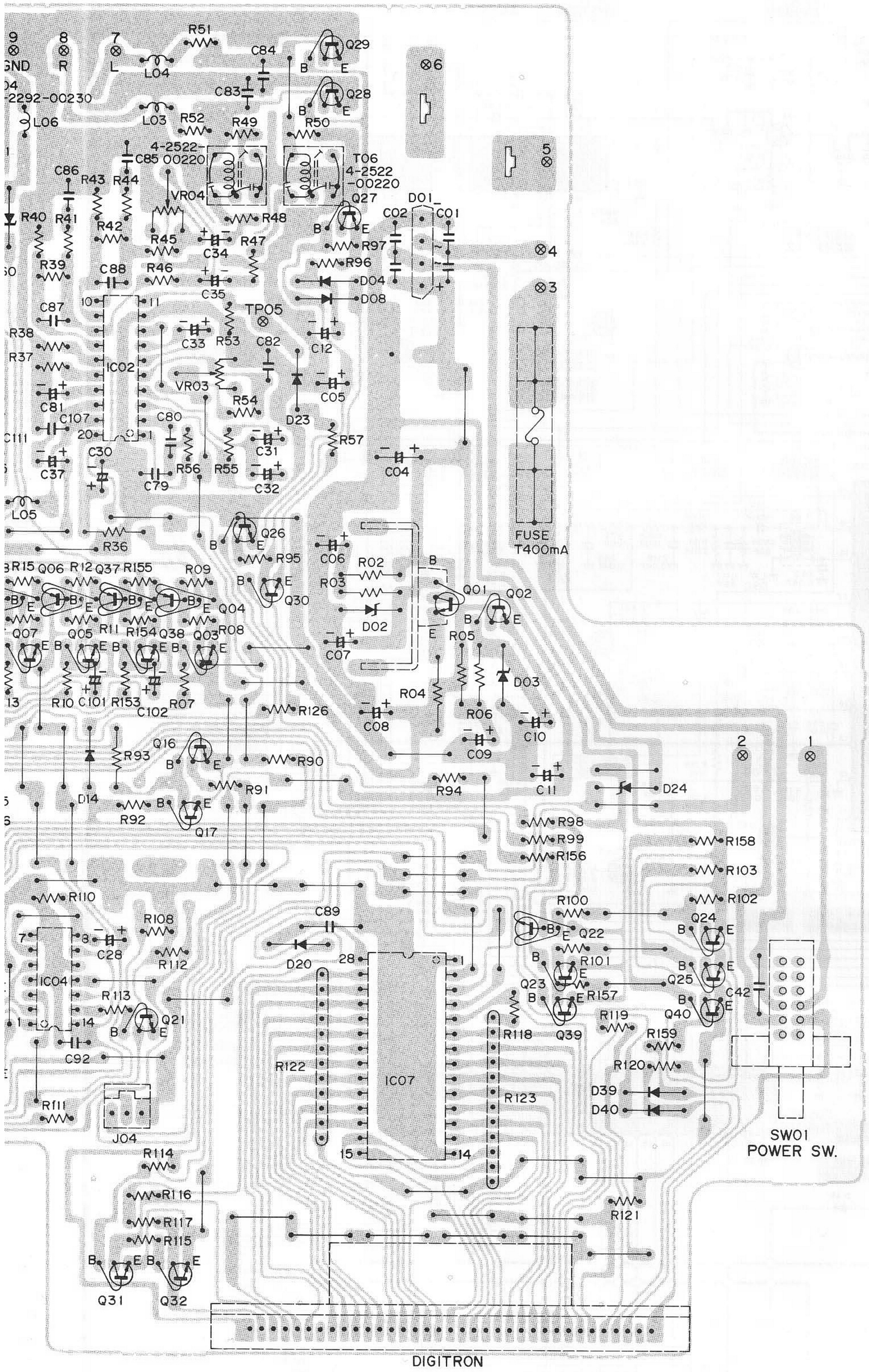
NOTES:

1. All resistors values are indicated in "ohm" (K=10^3, M=10^6).
2. All capacitors values are indicated in "μF" (P=10^{-12}).
3. All voltages indicated on the schematics are measured under the following conditions.
   a. Use a V.T.V.M.
   b. All voltages ±10% with respect to chassis ground
   c. FUNCTION SW: FM ST/MUTE Signal Stereo L.E.D. ON
   d. The values in brackets show those obtained with FUNCTION SW set to "MW"
   e. AC input at 220 volts 50 Hz
4. This is a basic schematic diagram.



IC PIN NUMBERS DC VOLTAGES

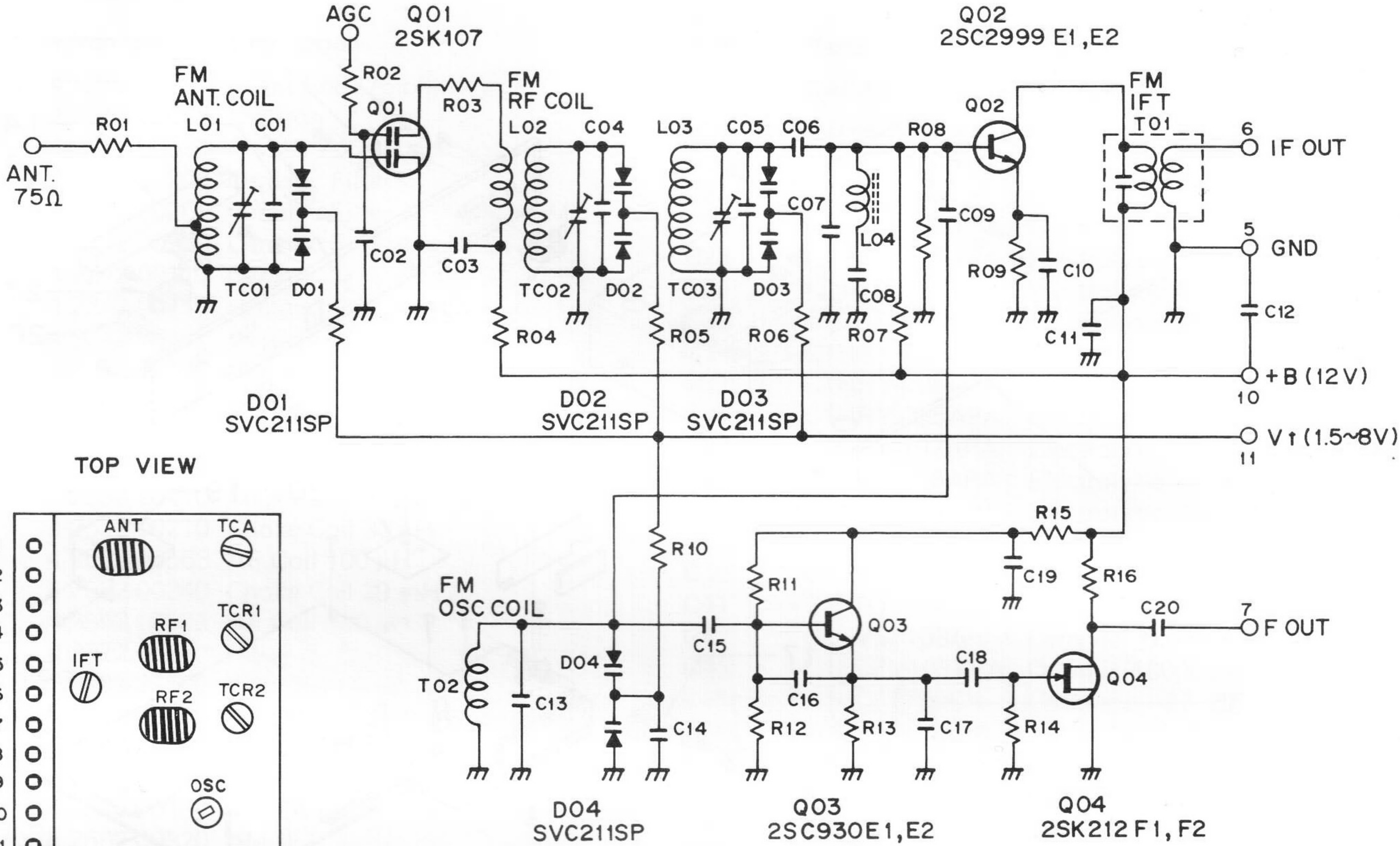
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
IC01	2.1V	2.1V	2.1V	0V	96mV	5.6V	5.6V	5.6V	5.6V	5.6V	12.5V	0.2V	5.2V	0V	0.3V	3.8V				
IC02	12.4V	4.6V	4.6V	0.2V	−3mV	1mV	4.5V	6.4V	4.5V	6.4V	3.3V	0V	0.6V	2.6V	2.4V	2.3V	2.5V	2.5V	2.5V	4.4V
IC03	05mV	0.6V	0.9V	0V	1.4V	1.2V	1.4V	1.4V	2.7V	9.8V	0.6V	0V	2.0V	12V	1.6V	3mV	3.8V	1.3V	1.3V	5mV
IC04	13.1V	0V	0V	0V	0V	0V	0V	0V	0V	0V	1mV	0V	13.1V	13.1V						
IC05	5.2V	–	4.4V	0V	3.8V	3.9V	2.1V													



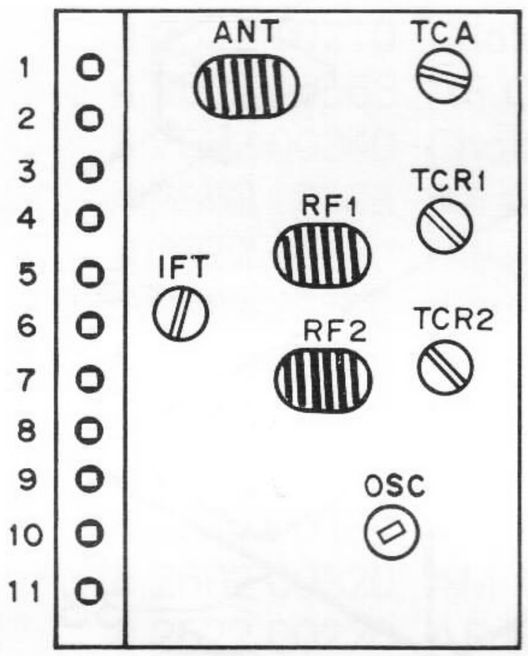
TRANSISTOR DC VOLTAGES				
SYMBOL No.	DEVICE	B	C	E
Q01	2SD325	14.1V	18.9V	13.5V
Q02	2SD400	6.5V	13.1V	5.9V
Q03	2SC536	65mV	13V	0V
Q04	2SA608	13.1V	13.1V	13.1V
Q05	2SC536	1mV	13.1V	0V
Q06	2SA608	–	1.3V	13.1V
Q07	2SC536	0.6V	104mV	0V
Q08	2SA608	12.3V	–	13.1V
Q09	2SC930	1.5V	11.9V	0.9V
Q10	2SC536	123mV	8.3V	0V
Q11	2SC536	6.2V	5.6V	5.6V
Q12	2SA608	1mV	96mV	0.2V
Q13	2SC536	2mV	2.0V	3.8V
Q14	2SK44	0.7V	5.8V	0.6V
Q15	2SC1570	0.6V	6.2V	0V
Q16	2SC3068	0.6V	145mV	0V
Q17	2SC536	2mV	0.6V	0V
Q18	2SC536	6.4V	5.9V	5.8V
Q19	2SC536	1mV	5.9V	2mV
Q20	2SC536	0.7V	0.2V	0V
Q21	2SC536	0.4V	172mV	0V
Q22	2SC536	0.6V	117mV	0V
Q23	2SC536	1mV	18.7V	0V
Q24	2SA608	18.2V	18.7V	18.9V
Q25	2SA608	18.8V	–1.7V	18.9V
Q26	2SC536	2mV	13.0V	0V
Q27	2SA608	13.0V	–0.2V	12.9V
Q28	2SD1012	–0.2V	–3mV	–3mV
Q29	2SD1012	–0.2V	–	0V
Q30	2SC536	0V	13.1V	–15mV

5	16	17	18	19	20
3V	3.8V				
.V	2.3V	2.5V	2.5V	2.5V	4.4V
5V	3mV	3.8V	1.3V	1.3V	5mV

FRONT END SCHEMATIC DIAGRAM



TOP VIEW



FM TUNER ALIGNMENT

FM ALIGNMENT – Function switch to FM STEREO

Note: It is almost unnecessary to adjust coil in Front End as parfectly adjusted.

ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
Note: The FM IF circuit utillizes a non-turnable ceramic filter which establishes the IF bandpass. To insure symmetrical Tuning and selectivity, the IF must be aligned precisely to the center of the filter bandpass, rather than to 10.7 MHz as in conventional LC circuits.				
1. S-CURVE ALIGNMENT	Connect 10.7 MHz Sweep Generator output to TP01 and ground lead to chassis. Use 5 pF capacitor in series with generator lead.	Position of non-interference	Connect gene-scope input to TP07.	Adjust FM DET (T01), so that S-wave form becomes sym-metrical.
2. DETECTOR ADJUST-MENT (MINIMUM T.H.D.)	Connect FM RF gener-ator to FM Antenna terminals. Set generator output level to 60 dB at 98 MHz±2 kHz.	Front Panel DIGITAL Counter Display Set to 98 MHz.	Harmonic Dis-tortion Analyzer to TUNER output.	Adjust FM DET (T02) for minimum gain and best linearity.
			Connect DC VTVM across TP02 and TP04.	Adjust VR02 until DC VTVM reads 0 V.
3. AGC ADJUST-MENT	Same as above	Same as above	Connect DC VTVM to Front End AGC termi-nal and ground lead to Chassis.	Adjust VR06 until DC VTVM read 100 mV.
4. Repeat steps 1 and 2 until optimum alignment is reached.				
5. FM MUTING LEVEL ADJUST-MENT	Set generator to 98 MHz. Adjust ATT output for 8 μV (18 dB).	Same as above	Scope vertical input to TUNER output.	Set Function Switch to FM ST/ MUTE and adjust VR01 until the received wave form becomes half of the maximum form.
Note: Decrease the output level of ATT and confirm that the wave form disappears. Increase the output level of ATT again and confirm that the input level meets the specifications sufficiently when the wave form has appeared.				
6. PLL IC FREE RUN FREQ. CONT. ADJUST-MENT (19 kHz)	Set generator to 98 MHz. Adjust ATT output for 60 dB.	Front Panel DIGITAL Counter Display Set to 98 MHz.	Connect Frequ-ency counter to TP05 and ground lead to chassis.	Adjust VR03 in multiplex circuit to obtain 19 kHz±50 Hz on Frequency Counter.
7. FM STEREO SIGNAL SEPARA-TION CONTROL	Connect FM stereo SG to FM Antenna terminals. 19 kHz sig-nal ON. Main channel, sub channel signal ON. Apply 1000 Hz signal from LEFT channel.		Scope and AC-VTVM to RIGHT TUNER output jack.	Adjust VR04 for minimum output.
	Same as above for RIGHT channel		Scope and AC-VTVM to LEFT TUNER output jack.	

AM TUNER ALIGNMENT

AM ALIGNMENT – FUNCTION switch to MW or LW position
Maintain generator output as low as possible for suitable indications.

Note:
Perform this alignment after FM Tuner Alignment.

ITEM	GENERATOR	DIAL SETTING	INDICATOR	PROCEDURE
1. AM IF ALIGN-MENT	Connect 450 kHz genescope output to Pin No. 14 and Pin No. 11.	Position of non-interference	Connect gene-scope input to TP06. Connect ground lead to Chassis.	Adjust AM IFT(T04) for maximum gain and best symmetry.
2. LW (RF) TRACKING ALIGN-MENT (153 kHz)	Do not connect gene-rator.	Front Panel DIGITAL Counter Display Set to 153 kHz.	Connect DC VTVM to B2 Terminal of FM Front End.	Adjust LW OSC Coil (T08) until DC VTVM reads 1.2V.
3. (360 kHz)	Same as above	DIGITAL Counter Display Set to 360 kHz.	Same as above	Adjust CV04 until DC VTVM reads 8.0V.
4. LW (RF) TRACKING ALIGN-MENT (160 kHz)	AM generator to EXT AM Antenna and GND terminals Set to 160 kHz. Modu-late with 400 Hz (30 % modulation).	DIGITAL Counter Display Set to 160 kHz.	Connect AC VTVM and Oscilloscope to TUNER output.	Adjust Bar Antenna (LW Coil) for maximum gain output.
5. (350 kHz)	Change generator setting to 350 kHz.	DIGITAL Counter Display Set to 350 kHz.	Same as above	Adjust CV01 for maximum gain output.
6. MW (RF) TRACKING ALIGN-MENT (522 kHz)	Do not connect generator.	Front Panel DIGITAL Counter Display Set to 522 kHz.	Connect DC VTVM to B2 Terminal of FM Front End.	Adjust MW OSC Coil (T03) until DC VTVM reads 1.0 V.
7. (1611 kHz)	Same as above	DIGITAL Counter Display Set to 1611 kHz.	Same as above	Adjust CV02 until DC VTVM reads 10 V.
8. MW (RF) TRACKING ALIGN-MENT (603 kHz)	AM generator to EXT AM Antenna and GND terminals Set to 603 kHz. Modu-late with 400 Hz (30 % modulation).	DIGITAL Counter Display Set to 603 kHz.	Connect AC VTVM and Oscilloscope to TUNER output.	Adjust Bar Antenna (MW Coil) for maximum gain output.
9. (1404 kHz)	Change generator setting to 1404 kHz.	DIGITAL Counter Display Set to 1404 kHz.	Same as above	Adjust CV03 for maximum gain output.
10. AM AUTO STOP ADJUST-MENT	Change generator setting to 999 kHz and output level to 64 dB.	Set to 999 kHz.		Adjust VR07, so that Auto Stop Function works at 999 kHz on DIGITAL Counter.

CAUTION: This precision high-fidelity instrument should be serviced only by qualified personnel, trained in the repair of transistor equipment and printed circuitry.